2007 BOTTOM TRAWL SURVEY OF GROUNDFISH RESOURCES IN THE GULF OF ALASKA

Prepared by Mark E. Wilkins

Cruise ID:	**2007-01**	Vessels:	***Sea Storm***
Cruise Dates:	**May 25 – August 7, 2007**		***Gladiator***
			Vesteraalen

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Overview

The tenth in a series of comprehensive bottom trawl surveys of groundfish resources in the Gulf of Alaska (GOA) region was conducted from May 25 through August 7, 2007, by the Resource Assessment and Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center (AFSC), Seattle, Washington. Since 1999 this survey has been conducted biennially; earlier surveys were conducted triennially between 1984 and 1999. This report summarizes the sampling operations and preliminary results of the 2007 survey.

The standard biennial GOA survey area, established in 1999, stretches from the U.S.-Canada border at Dixon Entrance (54° 30' N latitude) to the Islands of the Four Mountains at the base of the Aleutian Islands (170° W longitude) including depths from approximately 15 to 1,000 m. The entire standard area was surveyed in 2007, as it was in 1999 and 2005. Subsets of the standard area were sampled in 2001 (only the area west of 147° W longitude and depths to 500 m were surveyed) and 2003 (only stations shallower than 700 m were surveyed). Each of the earlier triennial surveys (1984-1996) covered the entire continental shelf to 500 m depths, but only the 1984 and 1987 triennial surveys included stations between 500 and 1,000 m.

Commercially valuable species of flatfish, roundfish, rockfish, and invertebrates inhabit the area. In many areas rocky bottom conditions provide abundant substrate for many species of bryozoans, hydroids, sponges and corals. These invertebrate communities, in turn, provide essential habitat for juveniles and adults of many groundfish species.

Objectives

The major survey objective is to continue the time series begun in 1984 to monitor trends in distribution, abundance, and population biology of important groundfish species and to describe and measure various biological and environmental parameters. Specific objectives of the 2007 survey include:

1. collect catch and effort data which can be used to describe the distribution and estimate the abundance of principal groundfish and invertebrate species that inhabit the Gulf of Alaska;
2. collect data to define population biology parameters, *i.e.,* size, sex, age, growth, length-weight relationships, feeding habits, and spawning condition for selected species;
3. monitor and collect trawl performance information; and
4. collect samples and data requested by other researchers or research groups.

Vessels and Gear

The *Gladiator, Vesteraalen,* and *Sea Storm* are all house-forward trawlers with stern ramps, multiple net storage reels (mounted forward of the working deck and/or aft over the stern ramp), telescoping deck cranes, propeller nozzles, and paired, controlled-tension hydraulic trawl winches with 1,800 (*Gladiator* and *Sea Storm*) or 2,100 m (*Vesteraalen*) m of 2.54 cm diameter steel cable. All three vessels measure 38 m in length (LOA) and powered by single main engines (1,710 continuous HP for *Gladiator* and *Sea Storm* and 1,725 HP for *Vesteraalen*). Each vessel is equipped with a full suite of state-of-the-art navigational and fishing electronics including Global Positioning Systems (GPS) with video position plotters, radars, color video fish-finders, and recording depth sounders. Each vessel's crew consisted of the captain, lead fisherman, engineer-fisherman, fisherman, and cook or cook-fisherman. The *Gladiator* was operated by Captain Ed French for the first and fourth legs and by Captain Buck Graham for the second and third legs. Captain Ken Sjong skippered the *Vesteraalen* for the first three legs, followed by Captain Tim Cosgrove on the final leg. The *Sea Storm* was operated by Captain Steve Branstiter for the first two legs and the final leg and by Captain Jerry Ellefson during the third leg.

Stations were sampled with the RACE Division's standardized Poly Nor'Eastern high opening bottom trawls rigged with roller gear, as described in Stauffer (2004)[1], Appendix 1. This trawl has a 27.2 m headrope with twenty-one 30 cm diameter floats and a 24.3 m long, ½-inch long-link alloy chain fishing line attached to a 24.9 m, 0.95 cm diameter 6×19 galvanized steel wire footrope. The roller gear is 24.2 m long and constructed of 1.9 cm diameter 6×19 galvanized steel wire rope and 36 cm rubber bobbins separated by a solid string of 10 cm rubber disks. In addition, 5.9 m wire rope extensions with 10- and 20 cm rubber disks were used to span each lower flying wing section. The trawls are constructed with 12.7 cm stretched-mesh polyethylene web with a 3.2 cm stretched-mesh nylon liner in the codend. Bridles consist of triple 54.9 m long, 1.6 cm diameter galvanized wire rope. Chain setback extensions to the headrope and side panel attachments are 46 and 23 cm, respectively. Steel 1.83 × 2.74 m V-doors weighing approximately 800 kg each are used to spread the net. Fishing dimensions of the trawls were measured using Scanmar[2] acoustic net mensuration equipment and fishing performance was monitored with electronic bottom contact sensors and Seabird SBE-19 micro-bathythermographs. Among all acceptable performance tows with direct

[1]Stauffer, Gary (compiler). 2004. NOAA Protocols for Groundfish Bottom Trawl Surveys of the Nation's Fishery Resources. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-65, 205 p.

[2]Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

measurements, net width averaged 16.03 m (range 13.41 – 19.52 m) and net height averaged 6.77 m (range 3.85 – 8.94 m). Net dimension statistics by vessel were:

Vessel	Average Net Width (m)	Net Width Range (m)	Average Net Height (m)	Net Height Range (m)	Average Tow Depth (m)
Gladiator	16.00	13.81 – 17.85	6.73	4.38 – 8.52	167.35
Sea Storm	15.62	13.41 – 18.01	6.97	5.48 – 8.93	137.58
Vesteraalen	16.56	14.06 – 19.52	6.58	3.85 – 8.94	204.63

The minor differences in average net spread and height among the three vessels is at least partly explained by the average tow depth among the vessel, since net spread has been shown to increase with tow depth. Tow depth differences resulted from our station assignment scheme in the central part of the survey area that, for logistic purposes, assigned tows to vessels based primarily on minimizing travel time between stations. As a result, the *Sea Storm* sampled most of the nearshore stations, the *Vesteraalen* sampled most of the deeper stations, and the *Gladiator* sampled mostly in middle depths.

Itinerary

25 May	Charter begins. Load gear and supplies in Dutch Harbor and set up for sampling.
29 - 30 May	Vessels depart Dutch Harbor, conduct standardization exercises, and begin sampling for Leg 1.
13 June	End of Leg I, crew change at Sand Point, begin Leg II.
1 July	End of Leg II, crew change at Kodiak, begin Leg III
19 July	End of Leg III, crew change at Seward, begin Leg IV
6 - 7 August	End of charter, off-load gear in Ketchikan.

Survey Area

The survey is designed to assess the groundfish and invertebrate resources of the Gulf of Alaska continental shelf and upper continental slope in the area between the Islands of Four Mountains (170° W longitude) and Dixon Entrance (132°30' W longitude) between nearshore (minimum practical fishing depth is about 15 m) and the 1,000 m isobath, as shown in Figure 1. The total area covered by the standard survey is 320,006 km^2.

Survey Design and Methods

Methods employed during all AFSC RACE Division surveys follow the standards described in Stauffer (2004)[1], Appendix 1. These protocols serve to standardize the warp measurement and monitoring, use of auto-trawl instrumentation, operations procedures, and gear construction and maintenance.

Similar to previous surveys of the same area, the 2007 GOA survey employed a stratified-random design utilizing 59 strata based on the 100, 200, 300, 500, 700, and 1,000 m isobaths, major geographic features such as banks and gullies, and statistical areas of the North Pacific Fishery Management Council (NPFMC) and the International North Pacific Fisheries Commission. A modified Neyman optimum allocation strategy using data from previous GOA surveys was used to allocate effort among strata. Optimum allocation calculations were made for each of the principal groundfish species in each prior survey year based on that year's survey data and the estimated time to perform a tow in a given stratum as the cost variable (deeper tows take longer to execute and are more likely to require repeated tows to obtain a satisfactory sample; therefore they cost more). The mean of the resulting proportions was then calculated, resulting in an estimate of optimal allocation for each of the principal groundfish species. A weighted mean of these values was then calculated using the product of each species' current ex-vessel value times its biomass (as the weighting variable). This determined the proportion of total survey effort allocated to each stratum which, when multiplied by the estimated available effort (total number of tows), determined the number of tows assigned to each stratum.

The target on-bottom duration for a standard trawl haul is 15 minutes. Trawling time on bottom was estimated during the tow using real-time net configuration data (wingspread and headrope height) acoustically transmitted to the vessel. Position data (from GPS) were collected every two seconds throughout the tow. Temperature and depth were recorded every three seconds with a micro-bathythermograph attached to the trawl headrope. The bottom contact sensor, a recording tilt sensor attached to the fishing line to detect contact with the bottom, also collected data every three seconds. Final tow durations, start and end times, and geographic positions were estimated from all available information collected from each tow.

The operational guidelines for successfully completing a standard survey tow are:

- 15 minutes towing time at a speed of 3 knots, resulting in a distance fished of approximately 1.4 km (0.75 nmi). Some tows were cut short due to hang-ups or to avoid obstacles that would cause gear damage. Tows as short as 10 minutes, if meeting all other success criteria, were judged acceptable.
- Appropriate length of trawl warp was deployed, as specified in the standard survey scope table. The goal of each tow was to not exceed 10 m of depth change over the 15-minute towing period.
- Net mensuration indicates that fishing gear was operating within normal limits, taking into account that the net width tends to increase and net height decreases as more trawl warp is deployed.
- Survey gear remained in continuous contact with the bottom.
- No significant hang-ups, gear damage or gear conflicts (e.g., crab pots).
- All sampling was done during daylight hours (all start and end times fell between 30 minutes after sunrise and 30 minutes before sunset).

Catches were sorted to species, weighed, and counted according to standard protocol. Extensive size composition data were collected with barcode-based recording devices and downloaded to a database after each tow. A variety of biological data including age structures (otoliths), lengths, and weights of individual specimens were collected and entered in the database.

Ancillary data and specimens were collected for researchers within the AFSC Groundfish Program, other AFSC research units, and other affiliated and non-affiliated agencies and educational institutions, including whole specimens, ovaries, a variety of tissues, and acoustic data. Scientists aboard the vessels also collected information on sightings of short-tailed albatross, marine mammals, and collected continuous echosounder data streams.

Results

Sampling generally proceeded from west to east. Some of the pre-assigned stations were not sampled due to untrawlable bottom conditions. In these cases, alternate station grid cells were sampled. Of the 892 standard survey tows attempted, 820 were successfully completed, ranging in depth from 16 m to 903 m (Fig. 1). Table 1 presents, in descending order, the cumulative catch of the most commonly caught species during survey tows in each of the NPFMC regulatory areas. A summary of the number of fish measured, by species and regulatory area, appears in Table 2 and Tables 3 and 4 summarize the biological data (length-weight observations and age structures, respectively) collected by species and regulatory area.

Over the entire survey area, the most abundant species in 2007 were, in order, arrowtooth flounder, Pacific ocean perch (POP), giant grenadier, Pacific halibut, walleye pollock, northern rockfish, flathead sole, and Pacific cod (Table 1). POP and arrowtooth flounder were the two most abundant species in the Western and Eastern GOA. The same two species, order reversed, were the two most abundant species in the Central GOA. Giant grenadier ranked third most abundant in the Western and Central GOA while Pacific halibut ranked third most abundant in the Eastern GOA. Estimates of abundance, distribution, and size composition from the survey results have been provided to stock assessment analysts for updates to the annual SAFE Report of the NPFMC's GOA Plan Team.

Water temperatures observed during the 2007 survey exhibited a much different pattern than previous GOA surveys, as cooler water infiltrated shallower depths, often with warmer water below. Water temperatures from GOA surveys, adjusted to remove the effect of date of collection on water temperature through the use of a general linear model, are shown in Figure x1, binned by half-degree longitude and depth (depth increments were finer at shallower depths to capture the rapid changes in water temperatures often seen in these depths). The very warm near-surface temperatures that were observed in 2003 and 2005 were largely absent in 2007. In all years prior to 2007, water temperatures at depths greater than 400 m have generally been cooler than 4 degrees C. In 2007, water warmer than 4 degrees C extended to almost 600 m most of the time. The pattern of water temperatures in 2007 more closely resembles the pattern in 1993 than any other year, although the intrusion of colder water into shallower depths is much more pronounced in 2007.

Size composition estimates for the entire GOA are presented in Figure 2 for six of the most abundant groundfish species.

For further information, contact Mr. Russ Nelson, Director, Resource Assessment and Conservation Engineering Division, Alaska Fisheries Science Center, National Marine Fisheries Service, 7600 Sand Point Way NE, Seattle, WA 98115-6349. Telephone (206) 526-4103.

Scientific Personnel

Vesteraalen

Leg 1	Leg 2	Leg 3	Leg 4
Chris Rooper [a]	Mark Zimmermann [a]	Brian Knoth [a]	Mark Zimmermann [a]
Jay Orr	Elaina Jorgensen	Zach Baldwin	Jim Stark
Ron Payne	Teresa Jewell	Frank Shaw	Liz Mitchell
Wolfe Wagman [b]	Pilar Blanco [b]	Liz Mitchell	Katie McGourty [b]
Teresa Jewell	Zach Baldwin	Rachel Riley [c]	Craig Zora
Sarah Gaichas	Liz Mitchell	Kari Henderson [d]	Troy Buckley

Sea Storm

Leg 1	Leg 2	Leg 3	Leg 4
Michael Martin [a]	Michael Martin [a]	Nate Raring [a]	Paul von Szalay [a]
Bill Flerx	Nate Raring	Jon Short	Elaina Jorgensen
Alison Gardell [e]	Jenny Hall	Jenny Hall	Jess Melgey
Erika Acuna	Pam Woods	Chantel Wetzell [f]	Teresa Jewell
Cynthia Yeung	Kim Sawyer [g]	Rob Freyer	Adam Barkley
Mei-Sun Yang	Richard Hibpshman	Mei-Sun Yang	Richard Hibpshman

Gladiator

Leg 1	Leg 2	Leg 3	Leg 4
Ned Laman [a]	Paul von Szalay [a]	Bill Flerx [a]	Jay Orr [a]
Brian Knoth	Delsa Anderl	Chris Rooper	Nancy Roberson
Chris Johnston	Guy Fleischer	Nancy Roberson	Pam Woods
Gary Mundell	Sally Roman	Wolfe Wagman	Greg DeCelles
Jim Stark	Jared Guthridge	Katie Palof [c]	Lisa Kamin [c]
Paul Logan [h]	Paul Logan [h]	Paul Logan [h]	Paul Logan [h]

[a] Field Party Chief

Personnel are AFSC staff from Seattle, Kodiak, or Auke Bay (ABL, Juneau) unless noted as follows:

[b] Volunteer

[c] Intern – AFSC ABL

[d] Intern - Western Washington University

[e] Hollings intern, affiliated with AFSC and California Academy of Sciences, San Francisco, CA

[f] Intern - University of Washington

[g] Visiting scientist through the University of Washington SAFS Fish Collection

[h] International Pacific Halibut Commission, Seattle, WA

Table 1: Total cumulative catch estimates for the most commonly captured fish species, by North Pacific Fisheries Management Council regulatory area and the entire Gulf of Alaska, ranked in order of relative abundance.

Western Gulf of Alaska			*Central Gulf of Alaska*		
Name	**Weight (kg)**	**Count**	**Name**	**Weight (kg)**	**Count**
Pacific ocean perch	22,774	39,826	Arrowtooth flounder	103,343	123,463
Arrowtooth flounder	17,444	31,317	Pacific ocean perch	37,398	56,570
Giant grenadier	12,709	4,261	Giant grenadier	24,485	9,004
Northern rockfish	9,297	10,366	Pacific halibut	16,871	5,599
Pacific cod	8,821	6,379	Flathead sole	13,050	35,973
Pacific halibut	8,126	3,969	Walleye pollock	12,677	28,945
Walleye pollock	8,035	12,572	Sablefish	11,257	4,239
Atka mackerel	6,214	4,976	Northern rockfish	11,257	13,638
Flathead sole	5,926	20,230	Pacific cod	9,091	7,421
Southern rock sole	5,798	9,413	Rex sole	6,482	16,462
Northern rock sole	4,941	13,021	Southern rock sole	5,633	8,678
Yellowfin sole	1,874	4,127	Dusky rockfish	5,279	3,617
Sablefish	1,541	828	Dover sole	3,715	4,306
Shortspine thornyhead	1,091	4,527	Shortspine thornyhead	3,472	12,715
Rex sole	944	2,479	Northern rock sole	2,862	4,398
Sponge unident.	936	2	Starry flounder	2,750	1,124
Starry flounder	912	439	Eulachon	2,547	109,264
Yellow Irish lord	905	1,267	Blackspotted rockfish	2,319	1,991
Gigantic anemone	668	1,325	Pacific sleeper shark	2,156	13
Butter sole	486	1,030	Yellowfin sole	1,734	5,429
Dusky rockfish	444	321	Longnose skate	1,684	185
Scapula sponge	416	3,024	Big skate	1,350	92
Big skate	414	25	Gigantic anemone	1,289	3,373
Blackspotted rockfish	319	290	Rougheye rockfish	1,189	1,343
Alaska plaice	308	227	Aleutian skate	1,186	127
Prowfish	269	112	Spiny dogfish	1,117	443
Shortraker rockfish	234	97	Shortraker rockfish	1,071	328
Great sculpin	219	87	Butter sole	970	3,415
Magistrate armhook	218	881	Black rockfish	699	401
Aleutian skate	202	25	Popeye grenadier	691	5,570
Tree sponge	137	1	Alaska plaice	568	413
Metridium anemone	133	294	Lingcod	501	112
Dover sole	130	141	Sharpchin rockfish	422	1,277
Pacific sleeper shark	111	3	Magistrate armhook squid	410	826

Table 1: Continued.

Eastern Gulf of Alaska			*Total Survey Area*		
Name	**Weight (Kg)**	**Count**	**Name**	**Weight (Kg)**	**Count**
Pacific ocean perch	12,474	20,691	Arrowtooth flounder	130,986	168,580
Arrowtooth flounder	10,200	13,800	Pacific ocean perch	72,647	117,087
Pacific halibut	3,685	1,019	Giant grenadier	39,424	14,126
Sablefish	2,977	1,040	Pacific halibut	28,682	10,587
Shortspine thornyhead	2,904	12,800	Walleye pollock	22,930	47,238
Spiny dogfish	2,502	1,181	Northern rockfish	20,556	24,007
Shortraker rockfish	2,335	484	Flathead sole	19,738	58,791
Giant grenadier	2,230	861	Pacific cod	18,354	14,156
Walleye pollock	2,218	5,721	Sablefish	15,775	6,107
Pacific hake	2,005	2,517	Southern rock sole	11,795	18,799
Dover sole	1,712	2,321	Rex sole	8,258	23,455
Silvergray rockfish	1,662	952	Northern rock sole	7,802	17,419
Spotted ratfish	1,377	3,595	Shortspine thornyhead	7,467	30,042
Sharpchin rockfish	941	4,223	Atka mackerel	6,372	5,108
Blackspotted rockfish	907	711	Dusky rockfish	6,160	4,190
Rougheye rockfish	867	836	Dover sole	5,557	6,768
Lingcod	862	162	Starry flounder	3,918	1,704
Rex sole	833	4,514	Shortraker rockfish	3,640	909
Flathead sole	762	2,588	Spiny dogfish	3,627	1,628
Pacific herring	606	5,949	Yellowfin sole	3,608	9,556
Redstripe rockfish	509	1,006	Blackspotted rockfish	3,545	2,992
Pacific cod	442	356	Eulachon	2,853	119,719
Dusky rockfish	438	252	Pacific sleeper shark	2,267	16
Redbanded rockfish	429	466	Longnose skate	2,124	248
Longnose skate	389	56	Rougheye rockfish	2,123	2,235
Southern rock sole	364	708	Pacific hake	2,084	2,608
Eulachon	258	8,637	Gigantic anemone	1,977	4,737
Starry flounder	256	141	Big skate	1,975	143
Salmon shark	250	2	Silvergray rockfish	1,691	981
Big skate	212	26	Butter sole	1,487	4,546
Petrale sole	176	204	Aleutian skate	1,400	153
English sole	172	415	Spotted ratfish	1,377	3,595
Longspine thornyhead	160	1,706	Sharpchin rockfish	1,372	5,519
Primnoa pacifica	137		Lingcod	1,363	274

Table 2: Summary of length collections during the 2007 biennial trawl survey of the Gulf of Alaska, by species and North Pacific Fisheries Management Council regulatory area.

Length Frequencies

Name	Western	Central	Eastern	Total / Species
Spiny dogfish	3	438	953	1,394
Pacific sleeper shark	3	13	--	16
Bathyraja sp.	--	1	--	1
Big skate	22	91	26	139
Bering skate	--	109	12	121
longnose skate	5	181	53	239
roughtail skate	1	10	9	20
Alaska skate	1	28	--	29
Aleutian skate	20	125	1	146
Whiteblotched skate	5	--	--	5
Whitebrow skate	1	1	--	2
Pacific sanddab	--	--	213	213
Arrowtooth flounder	14,486	40,618	7,734	62,838
Greenland turbot	1	--	--	1
Pacific halibut	3,969	5,599	1,019	10,587
Flathead sole	7,006	17,012	1,523	25,541
Slender sole	--	16	448	464
Petrale sole	3	--	204	207
English sole	94	529	415	1,038
Dover sole	141	3,741	2,047	5,929
Deepsea sole	--	11	5	16
Rex sole	2,407	10,998	3,900	17,305
Yellowfin sole	1,453	1,416		2,869
Starry flounder	432	870	141	1,443
Sand sole	36	196	5	237
Northern rock sole	7,835	3,146		10,981
Southern rock sole	6,930	6,432	485	13,847
Butter sole	522	1,379	101	2,002
Curlfin sole	--	--	17	17
Alaska plaice	227	369	--	596
Sturgeon poacher	--	13	--	13
Pacific sand lance	--	7	--	7
Bering wolffish	4	--	--	4
Sablefish	797	3,759	1,040	5,596
Searcher	8	91	--	99
Pacific herring	--	132	552	684
Pacific grenadier	15	320	58	393

Table 2: Continued.

Length Frequencies

Name	Western	Central	Eastern	Total / Species
Giant grenadier	1,412	1,696	485	3,593
Popeye grenadier	336	1,254	276	1,866
Armorhead sculpin	2	11	--	13
Darkfin sculpin	2	11	--	13
Yellow Irish lord	1,189	486	--	1,675
Scissortail sculpin	1	--	--	1
Ribbed sculpin	--	1	--	1
Warty sculpin	1	--	--	1
Great sculpin	84	149	--	233
Plain sculpin	29	269	--	298
Spinyhead sculpin	3	121	--	124
Bigmouth sculpin	9	40	2	51
Pacific sandfish	--	168	--	168
Pacific tomcod	1	523	237	761
Pacific cod	3,732	5,001	356	9,089
Pacific flatnose	2	18	21	41
Walleye pollock	7,655	12,911	4,202	24,768
Lingcod	--	112	162	274
Atka mackerel	956	131	--	1,087
Whitespotted greenling	--	22	--	22
Kelp greenling	85	118	1	204
Pacific hake	1	89	2,259	2,349
Eulachon	56	3,849	1,669	5,574
Capelin	59	269	126	454
Chinook salmon	1	21	5	27
Coho salmon	--	4	8	12
Pink salmon	--	8	5	13
Chum salmon	--	56	9	65
Sockeye salmon	--		2	2
Prowfish	111	69	2	182
Wattled eelpout	14	--	--	14
Shortspine thornyhead	3,973	7,818	6,769	18,560
Longspine thornyhead	--	354	909	1,263
Rougheye rockfish	56	1,317	835	2,208
Blackspotted rockfish	290	1,173	581	2,044
Pacific ocean perch	3,675	10,232	7,078	20,985
Silvergray rockfish	--	29	952	981
Dark rockfish	16	40	--	56
Dusky rockfish	321	1,267	230	1,818

Table 2: Continued.

Length Frequencies

Name	Western	Central	Eastern	Total / Species
Darkblotched rockfish	--	1	19	20
Splitnose rockfish	1	--	2	3
Greenstriped rockfish	--	--	155	155
Widow rockfish	--	1	11	12
Yellowtail rockfish	--	1	30	31
Rosethorn rockfish	1	--	240	241
Quillback rockfish	--	3	28	31
Black rockfish	1	115	7	123
Bocaccio	--	--	2	2
Canary rockfish	1	--	22	23
Northern rockfish	1,980	2,740	3	4,723
Redstripe rockfish	2	122	528	652
Yelloweye rockfish	9	22	41	72
Redbanded rockfish	12	119	466	597
Harlequin rockfish	108	368	341	817
Pygmy rockfish	--	12	50	62
Sharpchin rockfish	19	378	1,729	2,126
Shortraker rockfish	97	328	481	906
Yellowmouth rockfish	--	--	22	22
Total / Region	72,730	151,498	52,319	276,547

Table 3: Length-weight data collected during the 2007 biennial trawl survey of the Gulf of Alaska, by species and North Pacific Fisheries Management Council regulatory area.

Length-Weight Measurements

Name	Western	Central	Eastern	Total / Species
Salmon shark	--	--	2	2
Spiny dogfish	1	70	302	373
Pacific sleeper shark	2	4	--	6
Bathyraja sp.	--	1	--	1
Big skate	11	60	19	90
Bering skate	--	64	4	68
Longnose skate	4	94	29	127
Roughtail skate	--	--	4	4
Alaska skate	--	18	--	18
Aleutian skate	8	96	--	104
Whiteblotched skate	2	--	--	2
Arrowtooth flounder	404	429	364	1,197
Pacific halibut	--	--	1	1
Flathead sole	133	625	61	819
English sole	25	141	--	166
Dover sole	45	326	134	505
Deepsea sole	--	1	--	1
Rex sole	80	503	102	685
Yellowfin sole	36	99	--	135
Starry flounder	26	88	--	114
Northern rock sole	332	209	--	541
Southern rock sole	190	259	--	449
Butter sole	1	32	--	33
Alaska plaice	1	106	--	107
Sturgeon poacher	10	--	--	10
Pacific sand lance	--	7	--	7
Sablefish	86	433	80	599
Alaskan ronquil	1	--	--	1
Searcher	13	20	--	33
Pacific herring	--	62	3	65
Giant grenadier	57	64	37	158
Armorhead sculpin	--	3	--	3
Darkfin sculpin	52	10	--	62
Longfin Irish lord	8	--	--	8
Yellow Irish lord	--	14	--	14
Roughspine sculpin	1	--	--	1
Plain sculpin	--	75	--	75

Table 3: Continued. ***Length-Weight Measurements***

Name	Western	Central	Eastern	Total / Species
Spinyhead sculpin	--	33	1	34
Pacific sandfish	--	69	--	69
Pacific cod	251	178	53	482
Walleye pollock	290	830	218	1,338
Lingcod	--	2	2	4
Atka mackerel	174	57	--	231
Whitespotted greenling	9	10	--	19
Kelp greenling	55	4	--	59
Eulachon	2	162	143	307
Capelin	18	38	1	57
Longfin smelt	--	--	34	34
Chum salmon	--	2	--	2
Prowfish	--	2	--	2
Shortspine thornyhead	168	354	185	707
Rougheye rockfish	17	167	168	352
Blackspotted rockfish	118	218	182	518
Pacific ocean perch	216	541	412	1,169
Silvergray rockfish	--	9	191	200
Dusky rockfish	300	615	151	1,066
Northern rockfish	808	1,050	--	1,858
Harlequin rockfish	2	59	26	87
Sharpchin rockfish	17	289	632	938
Shortraker rockfish	20	162	93	275
Total / Region	3,994	8,764	3,634	16,392

Table 4: Otolith specimens collected during the 2007 biennial trawl survey of the Gulf of Alaska, by species and North Pacific Fisheries Management Council regulatory area.

Otolith Specimens

Name	Western	Central	Eastern	Total / Species
Arrowtooth flounder	404	429	364	1,197
Flathead sole	133	569	61	763
Dover sole	45	206	134	385
Rex sole	80	241	103	424
Northern rock sole	332	142	--	474
Southern rock sole	190	259	--	449
Sablefish	86	433	80	599
Giant grenadier	57	64	37	158
Pacific cod	251	178	53	482
Walleye pollock	290	830	218	1,338
Atka mackerel	174	57	--	231
Shortspine thornyhead	168	354	185	707
Rougheye rockfish	17	167	169	353
Blackspotted rockfish	118	218	182	518
Pacific ocean perch	216	541	412	1,169
Silvergray rockfish	--	9	163	172
Dusky rockfish	300	615	151	1,066
Northern rockfish	808	1,050	--	1,858
Harlequin rockfish	2	59	26	87
Sharpchin rockfish	17	289	632	938
Shortraker rockfish	20	162	93	275
Total / Region	3,708	6,872	3,063	13,643

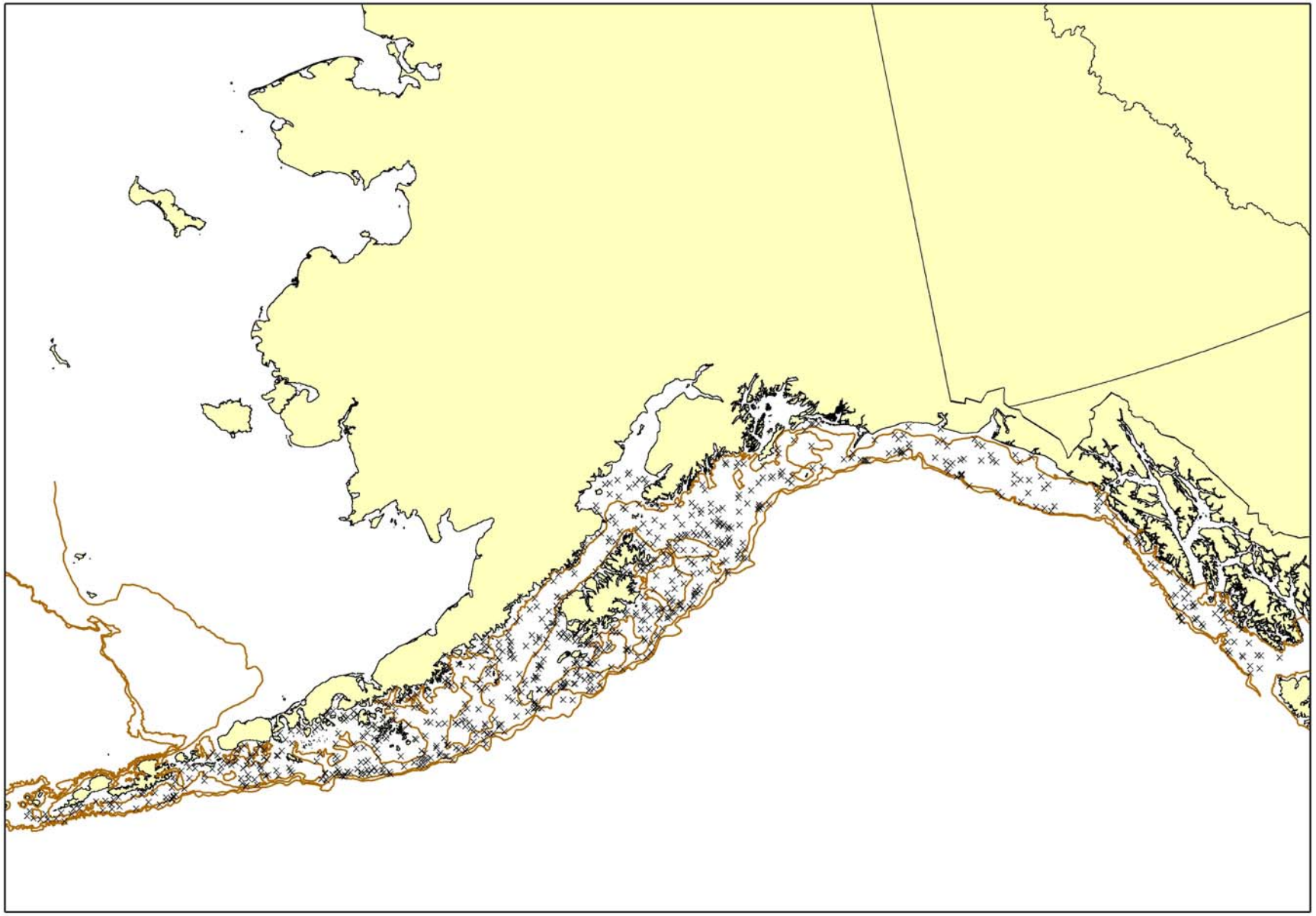

Figure 1.-- Locations of the 820 stations successfully sampled during the 2007 Biennial Gulf of Alaska Bottom Trawl Survey. Depths of successful tows ranged from 16 to 903 m. The 100, 500, and 1,000 m isobaths are shown.

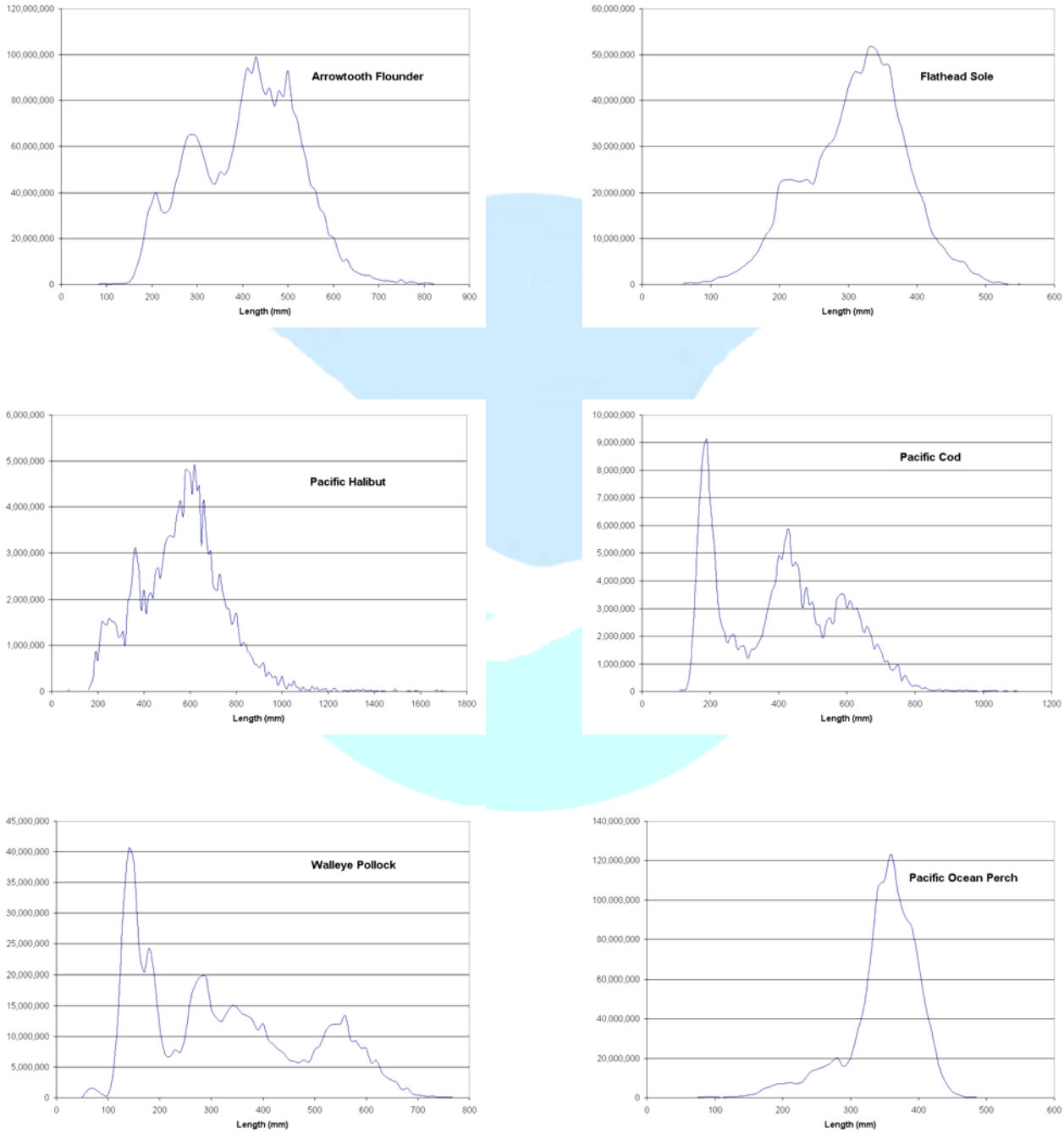

Figure 2: Estimated size composition (population number at length) for six major groundfish species assessed during the 2007 bottom trawl survey of Gulf of Alaska groundfish and invertebrate resources.